BIBLIOGRAPHIC AND REFERENCE COLLECTIONS - The Park has a full-time librarian who can assist you with searches of any previous work in your subject area that may have been conducted in the Park. There are 7,000 volumes in the library proper, but also extensive vertical files and the archives of the Park. The archives have approximately 23,000 black and white photographs from the early years of the Park, but also historic maps, journals, land survey records, etc. The library and archives are located in Sugarlands Visitor Center near Gatlinburg, Tennessee.

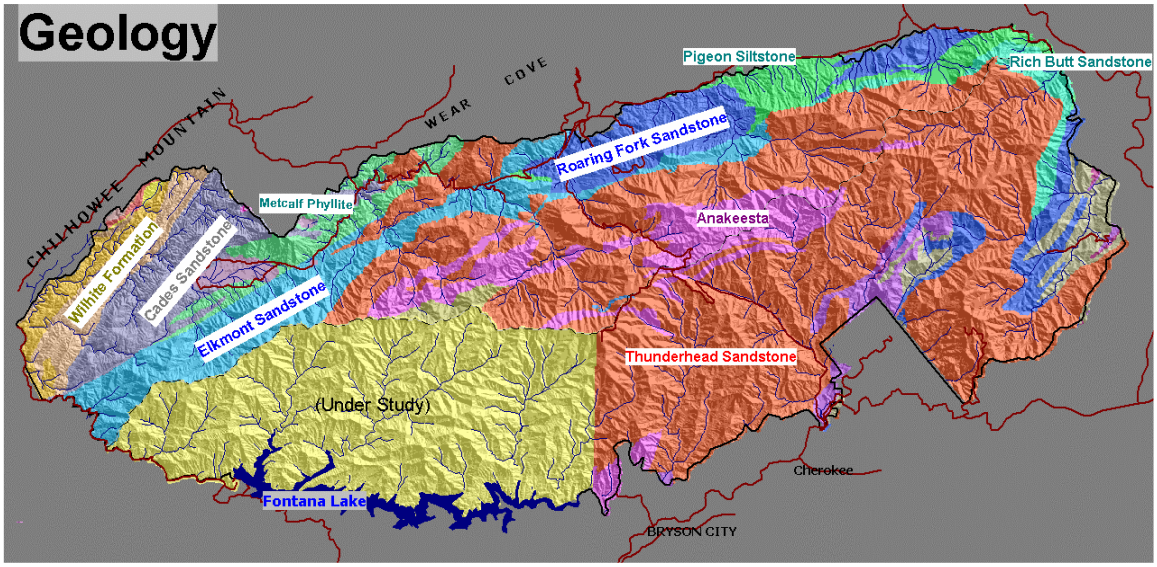
In addition, an agency-wide effort has recently been completed to compile a comprehensive bibliography of all natural resources source materials, such as reports, theses, "fugitive" data sets, etc. A free search of the Natural Resource Bibliography database of the Smokies' 3,000 sources is available on the Web at www.nature.nps.gov/nrbib/.

The Park's museum collection is managed by a full-time curator. The museum has over 50,000 natural history specimens. Many other specimens are deposited in public collections around the world. (The Park's policy is to obtain a synoptic collection of all species in the Park, generally with several specimens for each taxon.)

The Inventory and Monitoring Branch (I&M) of the Park also has a computerized, searchable database called "OBS" with over 24,000 natural history observations. These observations contain most of Mr. Art Stupka's journal entries as Park Naturalist from 1935-1963, but also many of more recent origin. The vast majority of observations are from Park biologists and other Park staff. If you have an approved Resource Activity Permit, contact the biological science technician in charge of the Natural Heritage Database for a free search of this growing data set.

There are also 5,000 35mm color slides that have been duplicated for interpretive programs by the Park's Resource Education Division that are available for reference at Sugarlands Visitor Center. They are not available for loan without special arrangements.

GIS—MAPS OF THE PARK - This section will present a short series of maps that are essential to understanding the Park environment, as well as for planning scientific reconnaissance or sampling activities. I&M staff members regularly acquire new data sets and develop new maps. For approved cooperators and with time allowing, they may be able to construct maps with customized themes and scales for your specific project.



Geology

Due to the profound influence of geochemistry and geomorphology on the distribution of all organisms in the Park, the importance of geology cannot be overstated. Note that a major fault cuts NE-SW across the west end of the Tennessee side of the Park, just east of Cades Cove. In brief, the Park contains:

-igneous rocks (Basement complex, on above map) that are rich in minerals and that usually weather into slightly basic soils,

-very acidic phyllites (Anakeesta formation on above map) that leach sulfuric acid when exposed and that often cause debris slides on certain slopes in the Park,

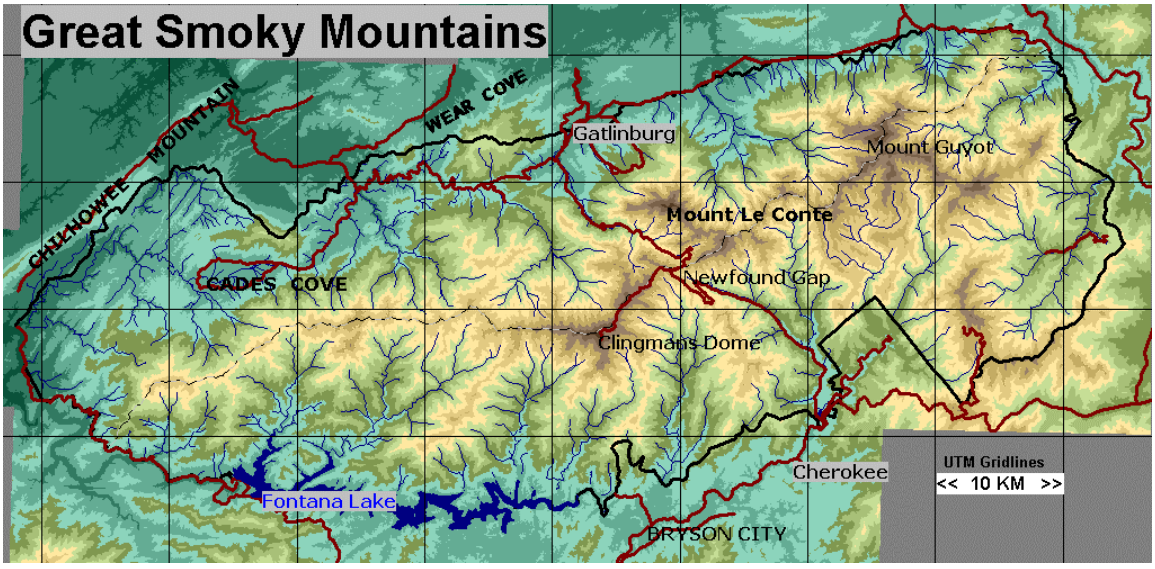
-massive sandstones (Thunderhead formation), which create many of the Park's waterfalls and make up over 1/3 of the geology. Often a conglomerate, some of these formations need to be split into discreet geologies.

-shales that are sometimes calcareous (Metcalf shale and Pigeon siltstone),

-carbonate rocks that form Cades Cove and other limestone "windows" in the Park, as well as various karst features, including 10 known caves (including the deepest cave in Tennessee), and

-alluvium, sparingly along the largest streams/rivers at the lowest elevations.

The bedrock in the southwest 1/4 of the Park was not mapped until very recently (by USGS). These data and geomorphology maps showing the Park's extensive boulder fields are just becoming available.



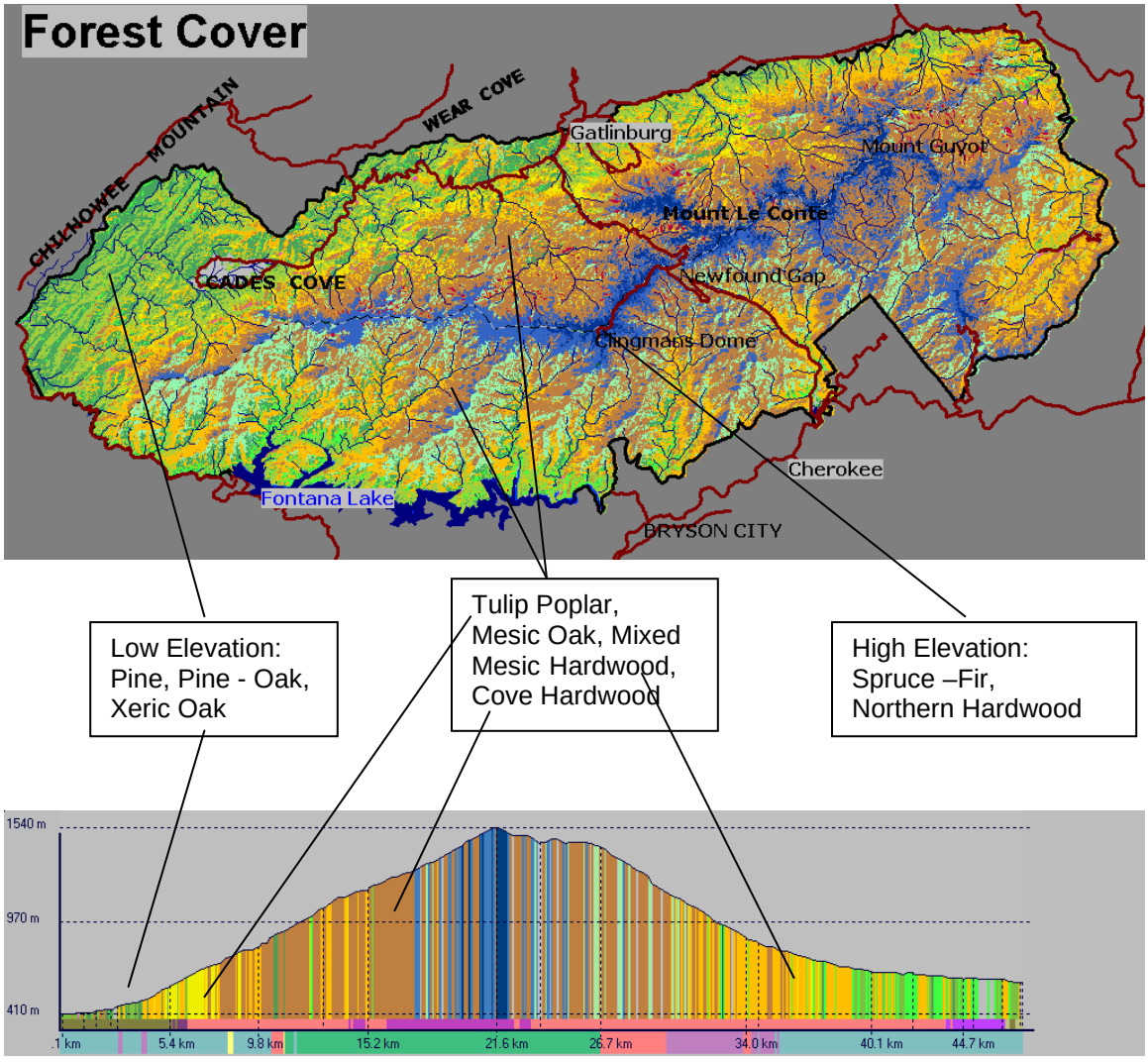
Topography

The Park area has one of the highest relief profiles in the eastern U.S. The Park's lowest elevation is at the west end of the Tennessee side of the Park, where Abrams Creek exits the boundary (approx. 270 meters above mean sea level), and the highest is at the summit of Clingmans Dome, which is a little over 2,000 meters above mean sea level. The highest portion of the Smokies occurs from the central part of the Park just west of the Clingmans Dome area and eastward along the spine of the ridge. Graphs are available illustrating the amount of parkland between various contour intervals and at various solar aspects.

Climate

Since the Gulf of Mexico is in relatively close proximity, maritime tropical air masses bring year-round moisture to the region. Precipitation varies from year to year, of course, but at lower elevations averages roughly 1650 mm (55 in), while at the highest elevations may average about 2500 mm (100 in). The higher elevation totals are conservative due to the fog interception phenomena of the conifers that predominate there. Fog occurs about 73 to 110 days/year at Noland Divide. Severe mortality of one of the conifer species confounds calculating natural precipitation amounts.

Long-term basic climate data (temperature and precipitation) are available at five sites in the Park, with additional meteorological data taken at five (other) air quality sites and two remotely-instrumented fire weather sites.



Profile of US Highway 441 from Gatlinburg to Cherokee. Highest Point at Newfound Gap

Forest Cover

Southern Appalachian forests are some of the most complex in temperate America. Five forest types dominate the Great Smoky Mountains. Together these forests support more than 130

species of trees and 4,000 other plant species. They represent all the major forest types along eastern North America. As elevation increases within the Park, temperature decreases and precipitation increases. Each 1,000 feet of elevation gained is the equivalent of moving 250 miles north. The additional precipitation classifies small sections of the Park as rainforest. All five types can be seen at once from Campbell Overlook, two miles south of Sugarlands Visitor Center on Newfound Gap Road (US 441).

The **spruce-fir** forest caps the Park's highest elevations. Most areas above 4,500 feet support some elements of this forest. It is best developed above 5,500 feet. In terms of climate, the spruce-fir forest relates to areas such as Maine and Quebec, Canada. The main components of the spruce-fir forest are red spruce and Fraser fir. Other important species include yellow birch, mountain-ash, hobblebush, and blackberries. The balsam woolly adelgid killed 95% of the Fraser firs over the past decade. Accidentally introduced from Europe, this tragedy threatens the fate of the entire forest type. The Park sprays to control the insect, but this is a labor-consuming process that requires saturation of each tree. Environmental pressures, including acidic deposition and ozone, present further threats.

A **northern hardwood forest** dominates the middle to upper elevations from 3,500- 5,000 feet. It mixes with many species from other forest types, but is characterized by sugar maple, American beech, and yellow birch. These forests resemble those throughout much of New England, New York, Pennsylvania, and southern Ontario. The northern hardwood forest, specifically sugar maples, produces the most brilliant fall color.

Drier ridges in and around the Park hold a **pine-oak** forest. Despite plentiful amounts of rain, these excessively drained slopes dry out often, and fire is a regular part of these forest communities. In late 1996, the Park began controlled burning to prevent unintentional fires from threatening lives and property. This also ensures natural regeneration of species requiring fire for propagation. Major species include red, scarlet, black, and chestnut oaks, along with Table Mountain, pitch, and white pines. Some areas also have hickories.

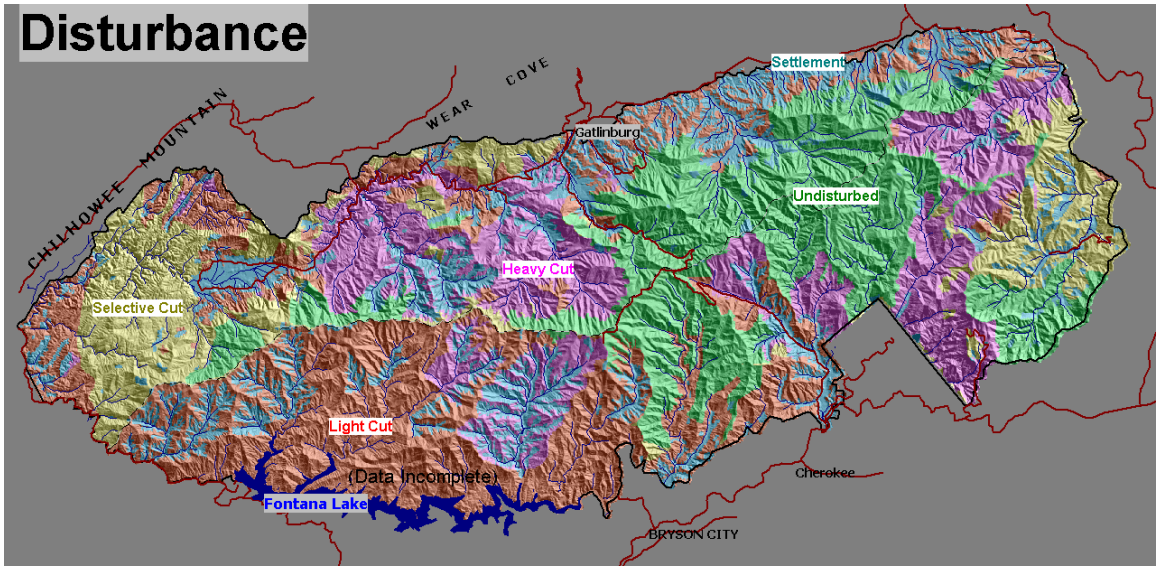
A **hemlock** forest often grows along streambanks. Water temperatures remain cold year round, and this cools and dampens the air. Hemlocks survive better in these conditions than any other species. Hemlocks dominate stream sides throughout the Appalachians. An insect, the hemlock woolly adelgid is moving south and west. It threatens every hemlock in the eastern United States.

The **cove hardwood forest** lines the valleys throughout the Park. It is the Smokies' most diverse ecosystem. Important species include, tulip poplar, American basswood, red maple, sweet gum, yellow buckeye, black birch, and dogwood. This lush, diverse forest enjoys warm temperatures, a long growing season, and plentiful rainfall.

The above information DOES NOT provide descriptions of the many distinctive vegetative communities that are embedded throughout the major forest types. For example: our 300 heath balds, grape thickets on north facing slopes, grassy balds on mountain summits, cliffs and outcrops, mid-elevation Table Mountain pine stands and many others.

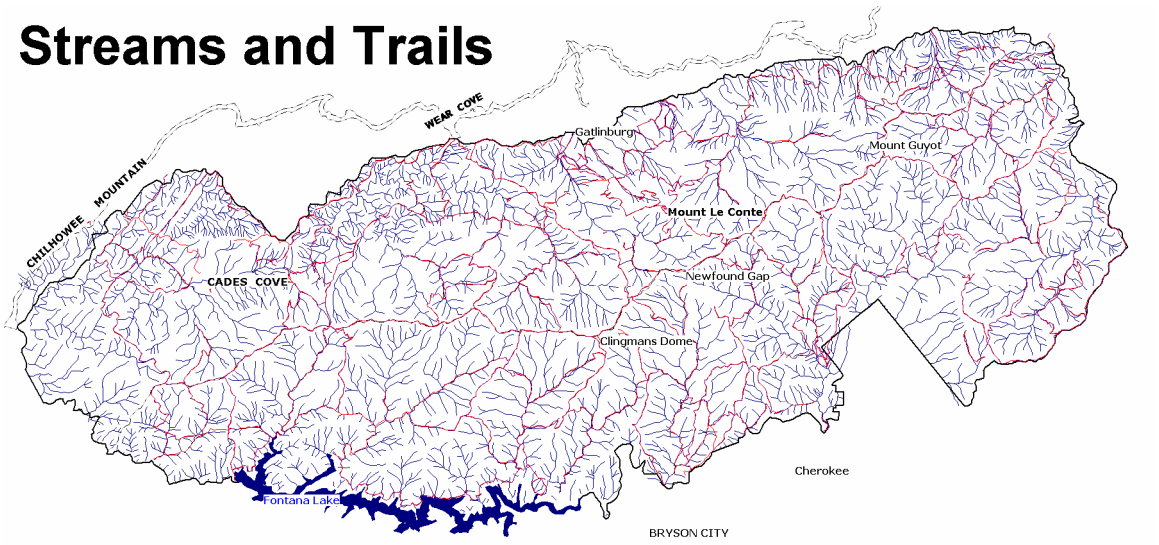
The Park has digitized data from LANDSAT on vegetation and has completed approximately 1/3 of a new air photo derived map of the Park's vegetation. The new map will have many more habitats classified, and with a minimum mapping unit of approx. 0.5 hectare.

Prospective researchers that are planning to conduct work well off-trail, should consult with the Park staff regarding areas with extensive thickets of rhododendron and other shrubs, which are often difficult to traverse.



Disturbance

The Smokies are famous for having probably the largest remaining uncut forests left in the eastern U.S. - over 40,000 hectares. (See GREEN and YELLOW areas on above map). Some of the old growth forests have structures that are more complex than second growth forests of the same type, which can mean higher diversities and/or abundances of certain species groups. These old growth areas have received attention from researchers trying to: 1) discover/describe remnant natural systems, 2) compare original old growth with the regional, continental, and global measurements.



Streams

There are 5180 kilometers (2000 miles) of permanent streams in the Park, and water quality is generally very high since all major streams originate within the Park. There are, however, several streams that are impacted with runoff from abandoned copper mines on the North Carolina side of the Park. Other streams are affected by acidity and elements leached from (mostly natural) debris slides where the exposed rocks are heavily mineralized. Other water quality issues are: high deposition of nitrate and sulfate at high elevations, decreased nitrogen uptake in old growth forest

(compared to rapidly growing second growth forests), impacts of activities in cultural zones and developed zones. Data are available from a USGS gauging station on Little River and possibly from other shorter-term water-oriented projects.

Trails

The Park's 1368 kilometers (850 miles) of maintained trails (see map in Streams Section above) cover most regions of the Park well. The maintained trail system is supplemented by a series of unmaintained paths, called man-ways. You should consult one of the Park's published trail guides for specific information on the condition, length, and steepness of trails and man-ways. These guides, various topographic maps, and many other materials useful to field workers are available from the Park's Natural History Association (865-436-0120, ext. 26, www.smokiesstore.org).

The layout of the Park trail system's 800+ miles is biased toward ridgetops and stream corridors, since these landforms make for easier and less damaging terrain in which to maintain trails. This should be taken into consideration when designing sampling strategies in the Park's backcountry. Some trails allow the use of pack animals. There are approximately 100 designated backcountry campsites for hikers, and some that allow horses as well.